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Appendix C - Applicants' Analysis of Conservation as an Alternative to the Construction of the Tripoli-Rhinelander 115 kV Transmission Project

History of Reliability Problems

Due to significant growth in the tourism industry, the Wisconsin Public Service Corporation service territory north of Wausau (Upper West area) has seen steady growth in the residential and commercial customer sectors. Additionally, the load growth in the industrial sector has been significant as well, with demand steadily increasing. This translates to increasing peak electric demands placed upon the Upper West transmission system. Based on current load projections, peak electric demand in the area will exceed the load serving capability of the transmission system by 2003.

WPSC Plans for transmission system reinforcements based upon a single contingency criterion. The criteria requires that, during peak demand periods, a forced outage to any single transmission system component will not cause other facilities to overload or cause system voltages to fall below acceptable levels. Overloaded transmission system facilities may experience fatigue or failure due to excessive heat, while unacceptable voltages may cause an interruption of service or damage to customer equipment. The problems that develop in the Upper West are related to voltage control and the potential for voltage instability or collapse following a single contingency.

Voltage stability analysis has determined that the Upper West area transmission system can supply a maximum of 220 MW during a single contingency. Current load projections predict an Upper West area peak demand of approximately 224 MW during the 2003 summer.

Purpose of the Line

The proposed Tripoli-Rhinelander 115 kV transmission line will provide voltage support to the area. The additional transmission system tie will also reduce thermal stress on existing facilities.

Targeted area planning objectives and screening criteria

A collaborative committee was convened in 1994 to investigate ways to defer or eliminate proposed transmission projects and developed screening criteria to assess which transmission projects may be amenable to Targeted Area Planning (TAP) solutions. Screening criteria included such things as timing, whether need was due to load growth and the rate of load growth, the geographic area to be addressed, environmental concerns and other factors.

Timing

The timing of the system determines the viability of TAP solutions. This project is needed for voltage support and to reduce thermal stress and requires 41 MW of load reduction by the year 2010, or approximately 5 MW per year.

Need type

The need for this line is the result of load growth in the area, principally in the residential sector, which is of a steady nature and amenable to TAP solutions.

Need location

The Wisconsin counties that are affected by the line are Langlade, Lincoln, Oneida and Vilas. These 4 counties can be generally addressed as a defined geographic area for TAP solutions.

Generation-type alternatives and their location as a means to defer this line are discussed in Section 4.6 of the Arrowhead-Weston CPCN Application (PSCW Docket No. 05-CE-113). The viability of renewable-type options are discussed in Section 4.7 of the same Application.

The possibility of a bulk load addition may be a mitigating factor for any conservation and renewable opportunities from a TAP screening perspective.

Environment

Environmental concerns of this project are being addressed. See Appendix A of the Arrowhead-Weston CPCN Application.

Other factors

There are no other factors that increase TAP opportunities in this project.

Review of the potential of conservation to defer the Tripoli-Rhinelander transmission project

Residential

The principal area of growth for the identified four-county area is the residential sector. The area has a total of 43,024 residential (single family and multifamily) customers. Of these, 13,652, or 32 percent, are seasonal. A data analysis of end-uses is shown in Table C-1.

Table C-1 Data analysis of end uses

End-Use	Single-Family Saturation (%)	Units	Multi-Family Saturation (%)	Units
Space heating	11	4,038	11	293
Supplemental space heating	28	10,279	28	745
Water heating	40	14,611	40	1,059
Room air	18	6,608	18	479
Central air	13	4,773	13	346
Refrigerator	130	47,726	130	3,458
Freezer	75	27,534	75	1,995
Lighting	100	36,712	100	2.660
Waterbed	12	4,405	12	319
Dryer	65	23,863	40	1,064
Dehumidifier	51	18,723	51	1,357
Range	62	22,761	62	1,649
Microwave	110	40,383	110	2,926
Furnace fan	89	32,874	89	2,367
Dishwasher	45	16,520	45	1,197
Miscellaneous	100	36,712	100	2,660

The end-uses that have the greatest plug-load impact (demand reduction) potential are water heating, room air, central air, refrigerators, and dehumidifiers. Space heating and supplemental space heating do not affect summer line conditions and are therefore not considered here.

The 100 percent replacement of all end-uses identified above falls significantly short of the required MW needed to defer this line:

Table C-2 Maximum potential plug-load demand reduction

Action	Total Units	MW Saved
Replace all water heaters	21,103	0.338
Replace all room air with more efficient units	9,544	1.241
Replace all central air with more efficient units	6,893	2.068
Replace all refrigerators with more efficient units	53,024	2.227
Timers for all dehumidifiers for no on-peak use	27,043	6.761
Total		12.635

The total units include an estimated number of units from seasonal customers.

The 12.6 MW represents technical potential. Of this, economic and market potential would be something even smaller.

Commercial/industrial

The county area has 13 large industrial customers and approximately 5,544 small commercial customers. Growth of the residential sector has created growth in the small commercial area, principally small offices, small retail, and other small miscellaneous stores and shops. The principal end-uses for these kinds of customers are lighting and HVAC.

Since the early 1990s, schools, hospitals and most larger commercial and industrials in the area have completed extensive lighting projects as part of WPSC's ongoing conservation efforts. In addition, many of the projects with industrial customers included changing motors to high efficiency and installing variable speed drives on motors. These are now standard practice for most customers and, in some instances, are now mandated by the state.

In the earlier years of energy efficiency programs, many lighting retrofits were done in the commercial and industrial area because of the very favorable paybacks. Then, the Public Service Commission of Wisconsin made a policy change that emphasized energy savings over demand savings that redirected much of the energy efficiency effort to lighting. Combined with new Federal efficiency standards, very little lighting potential remains in this area.

In the area of HVAC, assuming 100 percent replacement of all existing cooling units (based on 2 cooling units per each customer at 0.112 kW per unit from 1999 Commercial WiseUse DSM database), the potential conservation from small commercial customers falls significantly short of the required MW needed to defer this line, even when combined with conservation achieved in the residential sector:

Action	Total Units	MW Saved
Replace all cooling units	11,114	1.244 MW

Alternatively, it could be assumed that the potential commercial establishments are of the smaller, older "Mom and Pop" variety. Even then, assuming 100 percent replacement of all existing cooling units (based on 2 units per each customer at 0.30 kW from 1993 WPSC residential air conditioning planning numbers), the HVAC conservation potential from small commercial customers falls significantly short of the required MW needed to defer this line, even when combined with conservation achieved in the residential sector:

Action	Total Units	MW Saved
Replace all cooling units	11,114	3.334 MW

Conclusion

Conservation is not a viable option for the Tripoli-Rhinelander transmission line.

Despite not passing the TAP screening and knowing that conservation is not technically viable; the cost effectiveness of conservation alternatives was determined with proxy calculations. The following is an approximation of the cost that would be incurred to achieve the necessary load reductions through 2010:

Electric DSM 1998 year-end spending

Conservation, all sectors	$1,494,788
Load Management	19,262
Level 4 costs	3,589,020
	$5,103,070

Electric DSM 1998 year-end MW achievement

Conservation, all sectors	2.51
Load Management	1.60
	4.11

Cost per MW is $1,241,623.

Table C-3 Cost of DSM alternative to Tripoli-Rhinelander

Year	MW Needed	Cost	1999 Present Value*
2003	4.2	$5,214,816	$3,561,789
2004	5.3	$6,580,602	$4,086,036
2005	5.2	$6,456,439	$3,644,491
2006	5.3	$6,580,602	$3,376,889
2007	5.3	$6,580,602	$3,069,899
2008	5.2	$6,456,439	$2,738,160
2009	5.3	$6,580,602	$2,537,107
2010	5.2	$6,456,439	$2,262,942
			$25,277,316

*Assumes 10 percent discount rate.

The $25,277,316 is under stated by the following factors:

a. ramp up of infrastructure costs to achieve the necessary conservation
b. additional program and incentive costs to induce accelerated DSM

This estimation is not stated in present value revenue requirements (PVRR) terms.

No assumption is made that 41 MW of additional DSM exists to provide relief for the line.